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IBM Mainframe:
A study in business strategy

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Abstract

IBM Mainframe:
A study in business strategy

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On April 7, 2009, IBM celebrated the mainframe's 45th year. Drawing on its roots in punch-card tabulators, the machine has come a long way to become many customers' preferred e-business solution. Throughout its lifetime, IBM's strategy adapted the machine to the changing market. During the late 1960s, the introduction of the System/360 provided customers with compatibility and scalability across various computer lines. Popularity of the system began to suffer during the client/server era of the 1990s but it quickly recovered as the z Series server line was developed to support e-business solutions. IBM's strategy made the mainframe successful but continued improvements are still necessary to ensure its future success.

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IBM MAINFRAME: A STUDY IN BUSINESS STRATEGY

Chapter 1: Introduction

The IBM mainframe celebrated its 45th year on April 7, 2009. Drawing its roots in punch-card tabulators, the machine has come a long way to become many customers' preferred e-business solution. Designed to consolidate a wide range of early computer applications and to promote backward compatibility, this machine was a big success when first introduced in 1964. Throughout the years, the machine has been successfully adapted and reinvented in response to trends, innovations and declines in the market. Although IBM's strategy made the mainframe successful today, continued improvements to the mainframe's visibility in the market are still needed to ensure its future success.

Chapter 2: Mainframe's Roots

The roots of the mainframe stem from IBM's punch-card tabulators. Thomas Watson Senior, through careful spending and business savvy, built the company to be a leader in this market. Punch-card solutions were the trend within industries and generated a lot of profit for IBM. Over time, however, companies became inundated with punch-cards and began looking for alternate means to store and tabulate information. It was reported that Metropolitan Life Insurance "had three floors of its building devoted to storing the cards" (39). When IBM learned that Time-Life, a long-time customer, was considering making a transition into alternate means of storage, the company started to take serious action (Young 38 -39).

Watson's son, Thomas Watson Jr., began investigating alternate means of storage to understand the new market trends. He queried IBM's "top salesmen to look into the future of magnetic tape" (39). He learned that this new innovation in technology was reportedly "able to store thousands of records on a single tape spool" (39). Customers who were looking to reduce their storage space were already eagerly anticipating a machine capable of supporting this new technology. As a result, Watson decided to advance IBM's products into the computer age to meet the new growing demand in the market (Young 39).

The company began making a massive investment in the field of computers. Unlike his father, Watson Jr. was willing to spend enormous amounts of money necessary to make his effort successful. Although some wondered why IBM "was chasing the electronics grail when punch card tabulators were selling better than ever. Watson Jr. pushed on" (41). He recognized that this endeavor was a means for IBM to stay technically competitive in a changing punch-card market. By 1955, his massive

investments increased the company's debt to $255 million and "revenues more than tripled, from $215 million to $734 million" (43). Watson's strategy took the company into the computer age by investing in a promising new field. Computers ultimately eliminated the entire basis of IBM's original business of punch-cards. As the market shifted away from punch-card tabulators, however, IBM was now able to provide customers with computer alternatives (Young 42-43).

IBM leveraged its reputation to transition customers from punch-card tabulators to the company's computerized solutions. Even though customers acknowledged that their company's future relied on computers, they were uneasy about making the change alone. Clients wanted a "business-oriented sales and support personnel to help them out" (43). They needed someone to facilitate this transition. IBM was known for providing this type of superior service in the punch-card industry. By retaining the sales force and the same business model that made the punch-card tabulator market successful, IBM was able to use its reputation in the emerging computer market. Customers were more comfortable upgrading their current solutions knowing they had IBM's support personnel at their disposal (Young 37 -43).

Chapter 3: Road to Mainframe

From the mid to late 1950s, IBM achieved industry leadership in computing. The company made advances in computer technology while working on large government contracts. IBM provided computing solutions that spanned a wide range of scientific and commercial applications. Although the company successfully delivered unique solutions to its customer, it was spreading itself thin (Yost 53- 54).

Supporting the various computer lines became difficult as IBM's computer market grew. There were high production costs associated with manufacturing the different computer systems. Sustaining the various programming capabilities for the different computer types became very taxing. The company's effectiveness in the market was reduced because it was competing over a broad range of computers. The sales and service personnel needed training to provide support for each of the different systems (Pough 267). In his book, Yost remarks that, "even the talented and knowledgeable IBM sales force was not capable of effectively marketing all of these different computing systems" (59). IBM's various computer lines became very disorganized and needed restructuring (Yost 59).

IBM's customers also found flaws in the various computer lines. Since the different computer lines were not compatible with each other, it became difficult for customers to upgrade their systems. "Customers could not shift between [different computer lines] without incurring major switching costs" (Yost 59). In many cases, customers had to rewrite their current system's software in order to be able to upgrade to a newer system. Upgrading their systems became disruptive and costly. Customers started to seek solutions that were better designed to handle their business needs and compatibility (Pough 267-268).

Due to the rapidly growing need for compatibility, IBM initiated the SPREAD Task Group in 1961. The group's mission was to examine IBM's current line of computers and determine the products' future. What the group concluded was that in order to maintain its "competitive advantage over other firms," (59) all of IBM's current computer products needed to change. The group's report suggested making a new family of computers that provided backwards compatibility with subsequent system upgrades. This compatible family of computers would address the issues introduced by the current line of incompatible computers. By undertaking this strategy, IBM positioned itself to address the customer's and the company's needs (Yost 59).

Chapter 4: System/360

On April 7, 1964, IBM's latest line of computers was revealed to the world with the introduction of the System/360. Named 360 for each degree on a compass, the first line of mainframe computers was marketed to encompass a wide range of jobs and applications (Pough 275). The machine promoted compatibility which allowed customers to easily migrate to bigger and better lines of computers, as required by their businesses. Application development became easier to migrate since the new machine's architecture allowed for backwards compatibility. For IBM, focusing on one computer line allowed for a reduction in training costs of new personnel. The effectiveness of the sales staff was also greatly improvement. The System/360 was so successful that within a few years it captured 75% of the market while IBM's major competitors had less than 5% each (Yost 59 - 61).

System/360 was succeeded by the System/370. For the next two decades, IBM continued making improvements to the mainframe in order to maintain a competitive edge over its competition in the market, and to attract customers. "Early System/370 models were five times faster and 70 percent cheaper" (50) than some of the early System/360 models. Through subsequent innovations, models became as much as 26 times faster. Customers were able to benefit from these advancements in technology while seamlessly upgrading their systems as required by their businesses. Through these non disruptive means and backwards compatibility, IBM was able to advance customer's business solutions forward. Technological advancements also allowed IBM's business solution to keep up with advancements in the market's technology (Boyer 50-51). Although everything seemed to go well in the market, experts were predicting "that the

late 1970s and the early 1980s would mark the end of the mainframe-based solutions" (Ziegler 2).

Chapter 5: Mainframe's Downfall

When System/390 was introduced for the customer of the 90s, the mainframe became less desirable. "For some industry pundits it didn't look like the mainframe was going to survive the early 1990s" (51). In 1991, InfoWorld's Stewart Alsop, predicted that the mainframe would be unplugged within five years (Boyer 51). A gap began to form as personal computers (PCs) started providing customers with a cheaper alternative to the mainframe. For many, the personal computer alternative was a cheaper solution for their business needs. PCs were equipped with the ability to perform a lot of the computational functions that the mainframe was providing at lower costs. Customers could link their personal computers together at an office and create a distributed network solution that emulated the mainframe's centralized functions. A chasm in business solutions technology began to emerge as a new generation of workforce entered the scene and began adopting the PC based solution (Imhoff et al.).

As a new workforce generation began emerging on the market, it was not familiar with the mainframe. As Don Whitehead, Sun's director of mainframe migration, points out in a 2008 article, "they don't teach people how to run mainframe in college. Most of the mainframe programmers I know are looking at their retirement plans" (Kanellos). Even though the machine still continued to be the backbone solution of many big businesses, the machine's popularity began to suffer. A lot of the knowledge that was necessary to support these machines was limited to people who were already familiar with it (Kanellos).

The lack of information in the mainstream market lent itself to various misconceptions about the mainframe. Many businesses started to believe that the total cost of ownership of a mainframe was too high. Compared to the cheaper PC alternative,

this seemed true. A company could buy a number of inexpensive personal computes, use the client/server deployment method to connect them together as servers and create a personal distributed network. Doing so, customers could simulate a mainframe's functions at a fraction of the cost. Businesses could also maintain all their data locally and expand their networks as needed by adding more personal computers. Customers unfamiliar with the mainframe believed this to be a cheaper and simpler solution (Imhoff et al).

However, customers did not realize that the costs for distributed network environments increased linearly as the workload requirements increased. When new servers were attached to support new workload requirements, more people were needed to support it. Concurrently, as new servers were added to the networks, they needed to be synchronized with the servers already connected to the network. This meant that a "redundant copy of the operating system, database management system, and application software, data and utilities" (Imhoff et al. 27) was required. There were costs associated with each copy and data needed to be synchronized over a number of servers. This synchronization increased chances for discrepancies in data integrity and created security risks. The mainframe was ideal to solve a number of these issues, but IBM was not yet successfully leveraging open standards and the client/server model that was emerging in the market (Imhoff et al.).

Software compatibility also became a concern for some businesses. As personal computers entered the mainstream, a new generation of programmers began developing software solutions and applications on familiar platforms (Carico). Although IBM successfully developed and trained their mainframe professionals, many were beginning to near their retirement age. As Burt points out, "the bulk of students coming out of college have cut their teeth on new computing models" (Burt 34). As new and

sophisticated software became available, customers believed that they were not available on the mainframe system (Imhoff et al.). The gap in expertise was an issue IBM needed to address quickly. The mainframe's operating system needed to be adapted for a new generation of software developers.

By the end of 1994, IBM was beginning to suffer. "The company had racked up $15 billion in cumulative losses over the previous three years, and its market cap had plummeted from a high of $105 billion to $32 billion" (Hamel 138). Many started to believe in the conventional wisdom that distributed networks were the way of the future. The company's inability to reinvent itself in response to the changing world posed a potentially fatal obstacle. Fortunately, the emergence of the Internet and implementation of open standards revived the mainframe's marketability (Boyer 51).

Chapter 7: Mainframe's Recovery

While watching the 1994 Winter Olympics, David Grossman, a typical programmer, was one of the first IBMers to notice the Internet's potential to help the company. IBM was the official technology sponsor of the Olympics in Norway. The company provided all the data for the days' events. IBM created a centralized network at the Olympic village that could be accessed from various terminals. "IBM installed two mainframes, one to handle net operations and control data flow, and another to handle general data storage" (Cooney 11). Although all the data was maintained on a central IBM mainframe machine, the information was also provided publicly on the Olympics' website. What was misleading, however, was that the website was run by Sun Microsystems. The Internet was still fairly new at the time but it appeared as though Sun was actually the company providing the Olympics' data. Grossman realized that IBM did not even recognize this. There was a huge opportunity in the Internet and Grossman wanted to make sure IBM didn't miss this opportunity (Hamel 138).

Grossman began working with John Patrick to transform IBM's internal culture. At the time, everyone at the company was still using mainframe terminals for communication. Grossman and Patrick wanted everyone to switch to using the Internet. They encouraged employees to leverage the Web in order to effectively communicate with customers and to do electronic business (e-business). Although many seasoned IBMers felt skeptical about this new endeavor, IBM eventually began supporting their efforts. Lou Gerstner, IBM's CEO at the time, supported their ideas. His "early belief in the importance of network computing, dovetailed nicely with the logic of the Internet" (143). Patrick took their efforts even further by publishing a manifesto outlining how IBM could leverage the Web for it business (Hamel 138 - 143).

The nine page document described ways in which IBM should use the Web. The overall message was to bring customers and investors closer to IBM and its products. The manifesto stated that each employee should have an email address. Doing so would make employees, including top executives, more available to customers. The document also suggested making the company's homepage a critical tool in IBM's marketing and communication with customers. Through his manifesto, Patrick wanted IBM to leverage the Web for electronic commerce (e-commerce) and electronic business (e-business) (Hamel 140).

In subsequent years, IBM took steps towards e-business. As Gerstner remarked in a 1998 *InformationWeek* article, "the company is taking steps to help customers adapt to the strategic, organizational, and cultural changes mandated by the rise of electronic business" (Caldwell). IBM began retooling the mainframe system to reflect the market's new needs. Beginning with the System/390, the platform was upgraded to "accommodate the new and emerging client workloads" (Boyer 51). While maintaining backward compatibility, the new system structure provided support for the new Internet protocols. The machines leveraged the Internet to handle the client/server type of transactions.

IBM also equipped the mainframe with Linux. The new operating system (OS) bridged the software compatibility gap introduced in the mid 90s. Linux was an open source project developed by various members of the open source community. As a fully functional operating system, it came with components needed for system management, security and performance. Integrating it with the mainframe was a low cost option for IBM. The open source product provided free distribution and very flexible licensing restrictions. Users could enhance their system as needed for their businesses without incurring royalty fees. Unlike the previous OS, it was also enabled with Java

capabilities. The traditionally complex z/OS layer was simplified for people who were familiar with more standard operating systems such as Windows or Unix (Eilert et al 3-4, 32).

The zSeries 900 mainframe family was released in 2000 as the first system built for eBusiness. The new line "allowed thousands of servers to operate within one physical box" (Milberg). This feature gave the IBM mainframes a superior competitive advantage over the distributed network solutions. Customers could consolidate their servers into one machine. This new line also fully embraced the "new software standards of the open movement, Web serving, enterprise applications, and Linux workloads" (Boyer 51). The zSeries 900 line, was followed by the System z9 release in 2005 and System z10 in 2008. Using the latest z10 Enterprise Class mainframe solution, customers were able to replace approximately 1500 Intel x86 servers with 85 percent more energy efficiency (Milberg).

Through these transformations the mainframe made a comeback. Equipped with server capabilities, these machines continue to prove that they are a viable competitor against the distributed network solutions. Adapted for e-business, the mainframe's reliability and data integrity also makes them popular for businesses that want to support online transactions. Although personal computers and the distributed networks still play a role in various e-businesses transactions, mainframes can behave as powerful servers performing a majority of the critical operations (Boyer 52-53). In 2004, Steve Hamm comments that, "even today, a decade after the pundits declared the mainframe dead, more than 70% of the world's digital information resides on the machines" (Hamm 2004). In the same year, the research firm Gartner reported that, "IBM now dominates the mainframe market, with about 80 percent market share and growing" (LaMonica). Although the mainframe dominates, IBM strategy needs to stay focused on the ever-changing market.

Chapter 8: Recommendations for the Future

IBM needs to continue to educate the server market about the mainframe solution. Dennis Wunder is an IBMer who interacts with hundreds of customers at the Poughkeepsie briefing center in New York. In a 2008 interview, he surmised that based on his experience in the IT industry, customers continue to apply yesterday's answers to today's problems. He pointed out that ninety-nine percent of customers who are looking to reduce costs and simplify their IT infrastructure have followed the old client/server deployment model. Customers have continued to accrue servers in order to sustain their company's application needs. Over time these solutions have resulted in a "server sprawl" where, as Wunder points out, some companies have grown their 9,000 servers to 11,000 in a 15-month period. This drastic increase in hardware has a significant cost impact to a company. In order to reduce these costs, customers are looking for better solutions. Accordingly, IBM needs to be proactive in informing customers on the benefits of the mainframe (Carico).

The IBM Academic Initiative program is an example of how IBM educates the future workforce on mainframe concepts and technologies. In partnerships with different educational institutions, the company provides educators with the latest System z training tools. Students learn the skills and knowledge required to support the mainframe architecture ("IBM Academic Initiative System z program"). Dennis Wunder points out that in the IT industry, people follow their skills and prefer to work on familiar platforms. During the mid 90s, many people became accustomed to the client/server deployment method. This mainstream solution allowed many businesses to take this approach to address their various IT needs (Carico). In order for the mainframe solution to become a familiar platform and a mainstream solution, IBM needed to start educating the future

workforce early. By assisting colleges and universities in creating a curriculum for mainframe education, IBM is able to ensure the availability of mainframe experts in the future.

The company needs to continue to support this program and extend it to more universities if possible. This initiative is an excellent way to ensure the mainframe's viability in the market. Participating in the program, students get the training and education needed to support system z. They are equipped with a knowledge and skill set needed to improve and support the IT infrastructure of their future employers. The program also provides IBM's mainframe customers with qualified students for jobs and internships. It educates the next generation about the mainframe's benefits ("IBM Academic Initiative System z program").

IBM should also continue to innovate and consider new and non-traditional uses for the mainframe. In order to expand its market, different uses for the system should be explored. In mid-2000, for example, the mainframe system was used to host an online multiplayer game developed by Hoplon Infotainment. System z proved to be the best solution for this small Brazilian startup company who had limited funds (Hamm 2006). Traditionally, the mainframe market consists of a small number of large customers such as major banks or government agencies. In order to expand, however, IBM needs to prove the mainframe's versatility and flexibly to support different types of customers and needs. IBM needs to be sensitive to market trends in technology and explore future potentials.

The mainframe's strategy needs to fit IBM's overall goal of providing the best solutions for customers. The Smarter Planet initiative encourages clients to work with IBM to efficiently use technology to reduce costs, improve service and manage risk. Although the system z mainframe is the right solution for some business, it may not be

for others ("IBM: A Smarter Planet"). The IBM Server group encompasses a wide range of servers and each one needs to be equally represented to customers. For example, if a business is managing over 11,000 servers, it is likely to incur large costs associated with software licensing, power, cooling and human resources. If the customer is looking to reduce these costs, the mainframe is the smarter solution because the servers can be consolidated into a few mainframe systems. With a minimized number of resources, the customer can quickly reduce their operating costs (Carico). On the other hand, if one is looking to improve performance, a superior system or a hybrid solution might be optimal. The Smarter Planet initiative promotes problem solving to meet the customer's needs with the best suited IBM products ("IBM: A Smarter Planet").

IBM's representatives for the different server brands need to be well equipped to recommend solutions that best fit a customer's needs. Edward Gauthier, a senior consultant at the briefing center in Poughkeepsie, New York, remarks that historically some viewed the IBM server group as "a loose confederation of warring tribes;" promoting only products for which they are responsible (Gauthier). In order to be more effective, learning needs to occur across the different server lines. In doing so, consultants will be more knowledgeable of the benefits the other server lines provide and will recommend solutions that are best suited for each customer's unique needs. Although the Smarter Planet campaign encourages customers to work with IBM, the message is very broad and ambiguous. It is up to IBM team to educate potential customers with solutions that best meet their needs.

Chapter 9: Conclusion

The IBM mainframe has survived for over 45 years. IBM's strategy has reinvented and adapted the machine to accommodate new market trends and new customer needs. Even though analysts estimate that the sales "represent less than 4% of IBM's revenue in a good year, the combination of mainframe hardware, storage, software, and services account for nearly half of its profits" (Hamm 2009). If the company wants the mainframe to survive another 45 years, it needs to continue to be in tune with market trends and customer needs. IBM needs to make the market aware of the mainframe's presence and benefits. Opportunities for market expansion should be explored and IBM's company wide initiatives should be utilized to promote the mainframe's benefits.

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